REMARKS

The present Amendment amends claims 25, 26, 29, 30, 33 and 34 and leaves claims 27, 28, 31 and 32 unchanged. Therefore, the present application has pending claims 25-34.

Applicants again note that the Examiner did not consider the Information Disclosure Statement filed on August 31, 2001 along with the present application. Attached herewith is a Form PTO-1449 providing a listing and copies of the references submitted by the August 31, 2001 Information Disclosure Statement. An indication that the references listed therein have been considered is respectfully requested in the forthcoming Office Action.

Claims 25, 26, 29, 30, 33 and 34 stand rejected under 35 USC §102(a) as being anticipated by Govil (article entitled "Cellular Disco: Resource Management Using Virtual Clusters on Shared-Memory Multiprocessors"); and claims 27, 28, 31 and 32 stand rejected under 35 USC §103(a) as being unpatentable over Govil in view of Kauffman (U.S. Patent No. 6,633,916). These rejections are traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 25-34 are not taught or suggested by Govil or Kaufmann whether taken individually or in combination with each other as suggested by the Examiner. Therefore, reconsideration and withdrawal of these rejections is respectfully requested.

Amendments were made to the claims to more clearly describe features of the present invention as recited in the claims. Particularly, amendments were made to the claims to recite that the present invention

relates to a virtual computer system having a hypervisor which includes a load monitor for monitoring load conditions of virtual computers, a reallocation section for providing an output for dynamically changing allocation of physical resources to the virtual computers based on said load conditions monitored by said load monitor and a controller for controlling physical resource allocation to the virtual computers based on load conditions monitored by the load monitor and for demanding reallocation in response to the output from the reallocation section, wherein a result of implementing said actions is fed back to means for implementing the actions sequentially to lower loads to permit selection of actions that are effective.

According to the present invention the load conditions of virtual computers are, for example, an occupation rate of CPUs in each of the virtual computers, a length of queue for execution of process, frequency of paging or swap in main memory and response time of a process of an application program in each of the virtual computers, and allocation of the physical resources to the virtual computers is, for example, CPU allocation ratios, the number of CPUs, main memory allocation and swap areas of Disks shown in Fig. 22.

Further, according to the hypervisor could alternatively include a load monitor for monitoring load conditions of the virtual computers, a resource manager for monitoring physical computer allocation to the virtual computers, and a reallocation policy generator having an action table which includes contents of a plurality of actions for changing physical resources allocated to virtual computers judged as having high loads by the load monitor to reduce loads of the virtual computers judged as having the high loads.

According to the present invention, the reallocation policy generator decides reallocation of physical resources to the virtual computers based on the load conditions, the physical computer allocation and the action table wherein the action table can be updated by an administer of the virtual computer system.

The above described features of the present invention as recited in the claims are not taught or suggested by any of the references of record, particularly Govil and Kauffman, whether taken individually or in combination with each other as suggested by the Examiner.

Govil discloses a method of realizing memory allocation and CPU allocation under cost-performance tradeoffs. As to the CPU, GOVIL specifies that virtual CPUs are migrated to idle real CPUs so as to balance allocation of real CPUs, and alternatively virtual CPUs are allocated to real CPUs, by monitoring regularly, under a balanced mode in the order of priority decided based on the physical positions of the real CPUs and migration destinations. These functions as taught by Govil are almost the same as the functions of OS schedulers.

Kauffman discloses a method of reallocation of physical resources. However, the features of the present invention as recited in claims 25 and 29 are distinguishable from Govil and Kauffman since the present invention requires the monitor of the timing of system loads different from that of Govil. Furthermore, as to Claims 26 and 30, Applicants submit that it appears the Examiner has misjudged the meaning of "periodic changes" as recited in the claims. It appears the Examiner did not fully appreciate the load monitoring aspects of the present invention that detects periodic changes. To emphasize

these differences claims 33 and 34 were amended to recite that the action table is programmable by an administrator. Such features are not taught or suggested by Govil or Kauffman.

Moreover, as to claims 31 and 32, the tables about customer's information are implemented in Load Monitor. Such features are not taught or suggested by Govil or Kauffman.

Regarding Claims 25, 29 and 33 Govil discloses a system which implements software(VMM) developed for virtualizing, Cellular Disco running on cc-NUMA machine called FALSH developed in Stanford University, thereby executing a Virtual Machine(VM).

In page 234, Govil discloses machine resources (CPU or memory) are allocated dynamically in accordance with the priorities of Virtual Machines on demanding from each Virtual Machine, in a same way that OS schedules allocation of physical resources based on requests from User Applications and the priorities of them. In page 238, Govil discloses a balancing-policy module decides a physical CPU allocated highly loaded Job by VCPUs (virtual CPU), thus the load-balancing mechanism is maintained.

In pages 245-250, Govil discloses there are three migration destinations of VCPUs (on the same node, within the same cell, and across a cell boundary), a migration destination is decided by considering migrating cost and performance because their migration overheads are different respectively. Furthermore, scheduling of VCPUs are arranged by two policies in order that real CPUs do not idle as possible. One of the policies is that an idle balancer migrates VCPUs from real CPUS allocated many VCPUs to idle real CPUs. The other of the policies is that a periodic balancer reviews

allocation of real CPUs to VCPUs periodically so as to reduce memory contention on the basis of data structure called "load tree". Especially, memory is allocated like using local memory as much as possible in view of hardware structure.

Although, Govil may appear to teach changing of resource allocation in accordance with system load conditions, how such is implemented in Govil is entirely different from the present invention as recited in the claims. It is the feature of the present invention as recited in the claims that the load monitor 207 monitors the load conditions of the system, and LPAR controller 202 implements a plurality of action plans sequentially and conducts physical resource allocation according to contents of actions having various levels of effectiveness for lowering the load based on the monitored load conditions. Such features as recited in the claims are not taught or suggested by Govil.

Specifically, Govil does not teach or suggest a system that feedbacks the result of implemented action plans to permit the selection of action plans that are the most effective as in the present invention. Govil only discloses the idle balancer allocates idle CPUs of idle state (page 245); a periodic balancer monitors periodically imbalances of migrating VCPUs to real CPUs(Page 247); and the Operating System manages processes or threads under controls of both of balancers. These teachings of Govil do not anticipate or render obvious the above described feedback features of the present invention as recited in the claims.

Thus, Govil and the present invention are entirely different from each other as to the timing and motivation of monitoring load conditions, and of allocating resources. The periodic balancer described in Govil may be similar

to the load monitor of the present invention because of periodic monitoring of resources. However, the periodic balancer of Govil migrates VCPUs only on the basis of the load tree not according to a timing as in the present invention.

Considering the above teachings of Govil and the features of the present invention, referring to the feedback loop in the flowchart of Fig. 23 and paragraphs [0107]-[0109] in US 2002/0087611, Publication of this Application, amendments were made to the claims to clarify that "the result of action plans of reallocating resources is fed back" so as to distinguish the present invention from Govil and Kauffman.

It is a feature of the present invention as recited in claim 29 that the estimation of load conditions is based on the response time of application programs. Govil and Kauffman do not teach or suggest this feature.

Govil discloses that the system distributes loads of VCPUs in order to reduce imbalances of the numbers of VCPUs allocated to real CPUs. However, according to the present invention, when there is no problem with the response time, it is not necessary to reconstruct LPARS even if there are either real CPUs in the idle state or real CPUs in the overload state.

Further, as in the case of claim 25, claim 29 was amended to clarify that "the result of action plans of reallocating resources is fed back" so as to distinguish the present invention from Govil and Kauffman.

As per Applicants, the "reallocation policy generator" specified in claim 33 appears to correspond to "balancing-policy module" in Govil (page 238). However, GOVIL does not teach or suggest the various elements recited in the claims such as the "action table" specified in claim 33. Furthermore, according to the present invention an administrator can register proposals of

actions to the action table as desired. However, in Govil the administrator's intentions of resource allocation cannot be reflected to the system as desired, because Govil's system is "hard wired" since the balancing-policy module is implemented on a scheduler.

Thus, claim 33 was amended to clarify that "the action table can be updated by an administrator (or an operator)" so as to distinguish the present invention from Govil and Kauffman.

In pages 246, 247, Govil discloses there are three migration destinations of VCPUs (on the same node, within the same cell, and across a cell boundary), a migration destination is decided by considering migrating cost and performance because their migration overheads are different respectively. Furthermore, in Govil scheduling of VCPUs are arranged by two policies in order that real CPUs do not idle as possible. One of the policies as in Govil is that an idle balancer migrates VCPUs from real CPUS allocated many VCPUs to idle real CPUs. The other of the policies is that a periodic balancer reviews allocation of real CPUs to VCPUs periodically so as to reduce memory contention on the basis of data structure called "load tree".

From the Office Action it appears the Examiner judges that the periodic balancer of GOVIL monitors system condition periodically similar to the load monitor which is recited as in claims as detecting periodic changes of collected load data. The Examiner's judgment is incorrect. To further clarify this matter, the claims were amended to recite that "the load monitor finds regularity in load change" so as to distinguish the present invention from Govil.

It appears from the Office Action the Examiner considers the present invention as recited in claim 34 is the same as the inventions described in claims 26 and 30. However, claim 34 specifies "CPU occupation ratio" which recites the details of CPU load as described in claim 33. Govil does not teach or suggest that "CPU having a lower load offers certain percentages of CPU time to another CPU having a higher load" as in the present invention but that VCPUs allocated to real CPUs having a higher load is migrated to VCPUs allocated to real CPUs having a lower load. Further, Govil does not teach or suggest a time slice allocated to VCPUs is changed as in the present invention.

With respect to claims 27, 28, 31 and 33, the Examiner alleges that col. 2 line 28 - col. 3 line 4 of Kauffman describes "LPARs are set up by an administrator statically, but can respond to changes in load dynamically, and without rebooting, in several ways." Applicants submit that the Examiner incorrectly alleges that this teaching of Kauffman corresponds to the features of the present invention as recited in the claims.

Claims 27, 28, 31 and 32 specify that the system is controlled based on agreement conditions with the customers. This point is not disclosed in either of Govil and Kauffman.

Thus, as is clear from the above, Govil suffers from various deficiencies relative to the features of the present invention as recited in the claims and the above noted deficiencies of Govil are not supplied by any of the other references of record. Particularly the above noted deficiencies of Govil are not supplied by Kauffman. Therefore, combining the teachings of Govil with the teachings of Kauffman still fails to teach or suggest the features

of the present invention as recited in the claims and as such does not render obvious the features of the present invention as recited in the claims. Accordingly, reconsideration and withdrawal of the 35 USC §102(a) rejection of claims 25, 26, 29, 30, 33 and 34 as being anticipated by Govil and the 35 USC §103(a) rejection of claims 27, 28, 31 and 32 as being unpatentable over Govil in view of Kauffman is respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references utilized in the rejection of claims 25-34.

In view of the foregoing amendments and remarks, Applicants submit that claims 25-34 are in condition for allowance. Accordingly, early allowance of claims 25-34 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (520.40578X00).

Respectfully submitted,

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